BAKER
&
HOSTETLER LLP
COUNSELLORS AT LAW

WASHINGTON SQUARE, SUITE 1100 • 1050 CONNECTICUT AVENUE, N.W. • WASHINGTON, D.C. 20036-5304 • (202) 861-1500
FAX (202) 861-1783
WRITER'S DIRECT DIAL NUMBER

(202) 861-1624

DOCKET FILE COPY ORIGINAL

July 22, 1998

RECEIVED

JUL 22 1998

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

VIA HAND DELIVERY
Ms. Magalie Roman Salas
Secretary
Federal Communications Commission
1919 M Street, N.W.
Room 222
Washington, DC 20554

Re: ET Docket No. 98-80

Dear Ms. Salas:

On behalf of General Electric Company, we transmit herewith an original and nine copies of Comments in response to the Commission's Notice of Inquiry in the above-referenced proceeding.

Should there be any questions, please contact the undersigned.

Very truly yours,

Donald Zeifang

Enclosure

No. of Copies rec'd 0+9
List ABCDE

BEFORE THE

FEDERAL COMMUNICATIONS COMMISSION

WASHINGTON, DC 20554

In the Matter of	)	
	)	
1998 Biennial Regulatory Review --	)	ET Docket No. 98-80
Conducted Emissions Limits Below 30 MHz	)	
for Equipment Regulated Under Parts 15	)	
and 18 of the Commission's Rules	)	

RECEIVED

JUL 22 1998

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

To: The Commission

COMMENTS OF GE LIGHTING

Richard M. Jackson

General Electric Company
Lighting Legal Operation
Nela Park
Cleveland, Ohio 44112

Edward M. Yandek

General Electric Lighting
Nela Park
Cleveland, Ohio 44112

Donald Zeifang
Michael Ruger

Counsel to General Electric Company

Baker & Hostetler LLP
1050 Connecticut Avenue, NW
Suite 1100
Washington, D.C. 20036

Filed: July 22, 1998

BEFORE THE

FEDERAL COMMUNICATIONS COMMISSION

WASHINGTON, DC 20554

In the Matter of	)	
	)	
1998 Biennial Regulatory Review --	)	ET Docket No. 98-80
Conducted Emissions Limits Below 30 MHz	)	
for Equipment Regulated Under Parts 15	)	
and 18 of the Commission's Rules	)	

To: The Commission

COMMENTS OF GE LIGHTING

1. GE Lighting ("GE"), through counsel, files the following comments in response to the Commission's Notice of Inquiry ("Notice") in the above-captioned proceeding. GE has strong interests regarding conducted emissions limits for equipment regulated under Parts 15 and 18 of the Commission's Rules, as GE is a major US and international manufacturer, distributor, and seller of a wide variety of RF lighting devices. RF lighting devices have been successfully commercialized for both consumer and non-consumer application segments since the early 1980's, and now number in the many millions in the field. GE considers RF devices, which represent a major market segment for the company, to offer strong economic benefits to end users and the nation through reduced energy consumption. As a major broadcaster and licensee through its NBC operation, GE has a strong interest in ensuring that any potential changes in the conducted emissions adopted as a result of this proceeding do not adversely affect authorized radio services and communications. GE applauds the Commission's initiative in undertaking this review and trusts that the information and discussion provided will be of assistance to the Commission in carrying out its regulatory review obligations.

Background

2. GE makes and sells a wide variety of RF lighting devices. Some RF lighting devices are designed to replace the common, but less efficient and shorter life, incandescent bulbs that are well known to consumers. This type of RF lighting device, typically called a compact fluorescent lamp (CFL), can be used in an existing incandescent socket. The CFL consists of an integral RF power supply and housing that drives a small fluorescent bulb to produce light output that is generally equivalent to the widely used 60 through 100 watt incandescent lamps but with approximately only one third the energy consumption. As these products also reduce the emissions from fossil fuel power plants, utilities as well as the Department of Energy and the Environmental Protection Agency encourage the use of CFLs. A newer RF lighting device, the electrodeless fluorescent lamp (EFL), provides similar energy saving and pollution prevention benefits but promises to provide an even better dimensional fit with many existing household and commercial lighting fixtures than many of today's CFL offerings.[1] In addition, GE and other manufacturers sell another class of RF lighting device called electronic ballasts, which are physically separate from the typical linear fluorescent tubes that are most commonly found in offices, schools, and retail establishments. These systems tend to operate at higher power levels since they are generally designed to operate one to four 32 to 40 watt lamps. CFLs, EFLs and the linear electronic ballast systems capitalize on the facts that the basic fluorescent light source is very efficient, and that the lamps are more efficient when operated at RF frequencies rather than at traditional 60 Hz power line frequencies.

3. The United States has historically pioneered the development and commercialization of RF lighting technology. A conservative estimate of the number of RF lighting devices in use in the United

[1] CFLs and EFLs are discussed in GE's Petition for Waiver of Section 18.307c of the Commission's Rules (filed November 15, 1994) and in GE's comments in response to the Commission's 1998 Biennial Regulatory Review— (Continued)

States today is several hundred million. The majority of CFLs and electronic ballasts have fundamental operating frequencies in the 25 kHz through 100 KHz range. Readily available EFLs operate in the 2.2 through 2.8 MHz range in the United States.[2]

4. RF lighting devices reflect an excellent overall history of non-interference. Indeed, no serious issues have developed despite the rapid acceptance of the devices, the large volumes and many different types of devices sold, and the varied applications in consumer, commercial, and industrial environments. In its proceeding whereby the equipment authorization process for consumer RF lighting devices was changed from certification to a Declaration of Conformity by manufacturers, the Commission noted that RF lighting devices have an excellent history of compliance.[3]

5. The history of RF lighting suggests that a review of the conducted limits is warranted to ensure that the requirements are not too restrictive and are not too inhibiting to this beneficial new technology. Compliance with existing conducted emission limits can still represent a significant cost and often limits design options for RF lighting products. At the same time, a total disregard of conducted emissions may result in potential interference that would not only disrupt authorized radio and communications services but could result in serious customer dissatisfaction with any offending RF lighting device. Relaxation of overly restrictive or burdensome requirements should be performed in a manner that neither invites

---

(continued)
Amendment of Part 18 of the Commission's Rules to Update Regulations for RF Lighting Devices (Notice of Proposed Rule Making) (ET Docket No. 98-42, adopted April 11, 1998), filed July 2, 1998.

[2] Although some manufacturers have announced EFLs at 250KHz and 13.56 MHz, these devices are not readily available. Within the last several years, one very limited type of EFL, which uses a sulfur discharge rather than fluorescent lamp, has been sold that operates in the microwave oven range at approximately 2.4 GHz.

[3] See Amendment of Parts 2, 5, 18 and Other Parts of the Commission's Rules to Simplify and Streamline the Equipment Authorization Process for Radio Frequency Equipment (Notice of Proposed Rule Making in ET Docket No. 97-94), 12 FCC Rcd 8743 (1997) at ¶ 18; Report and Order (released April 16, 1998) at ¶ 21.

widespread interference to users of the spectrum nor creates a negative consumer image for future RF lighting devices.

6. As noted above, GE has filed comments in response to the Commission's Notice of Proposed Rule Making in ET Docket No. 98-42. The Commission has proposed in that proceeding certain limited and modest relaxations for conducted emissions over specified frequency ranges and for some classes of RF lighting devices. Those limited relaxations are warranted now, as demonstrated by the comments filed in the proceeding as well as the Commission's own positive experience in the form of an essentially trouble free field interference history for these classes of RF lighting devices. This proceeding should not delay action on the Notice of Proposed Rule Making in ET Docket No. 98-42.

Discussion

7. *Introduction.* GE does not dispute the general assertion that some level of conducted limits are required to ensure that there is minimal potential for widespread interference from Part 15 and 18 devices to radio services operating below 30 MHz. GE does, however, disagree with the Commission's statement at paragraph 9 of the Notice that competition plays no role in the minimization of potential interference. Customer satisfaction is a powerful influence for products in consumer and non-consumer market segments. Competitive factors would result in limiting conducted limits to the level that would cause no widespread interference, since going beyond that level, except for a nominal safety factor to account for product variability, provides benefit to neither the owner of the RF lighting device nor to the owner of the radio receiver -- in most cases, the same individual. At the same time, the intent of establishing conducted emission limits, be they mandatory or market driven, should not be to minimize emissions significantly beyond what is needed for compatibility. Otherwise, overly conservative designs will add cost, limit product acceptance, and reduce the commercialization potential of important new technologies.

8. While, if all regulation were removed, overall conducted emission levels would rise, most manufacturers would likely still self-limit conducted emissions to prevent interference. On the other hand, some small manufacturers or importers may not have the technical ability to properly determine the levels of conducted emissions that should be maintained to ensure compatibility with services below 30 MHz. Removing all regulations, without at least a step-phased approach to assess the result, would therefore potentially invite interference issues from some Part 15 and 18 devices. Some level of conducted limits are likely required to establish a level playing field among manufacturers of all sizes and technical levels and to establish a reasonable degree of compatibility between Part 15 and 18 devices and radio services below 30 MHz.

9. *Are Part 15 and Part 18 conducted emission limits still necessary?* While such limits are necessary, field experience indicates that the limit levels should definitely be beyond current requirements, and probably relaxed beyond the emission limits proposed by the Commission in ET Docket No. 98-42.

10. With respect to Part 18 RF lighting devices, the Commission should consider the following environments by major application segment. Consumer products are most often found in residences that do not use metallic conduit to carry branch circuit conductors. Very old homes still contain "knob and tube" wiring practices where conductors are separated by approximately one foot of space and supported on porcelain insulators. Newer homes typically utilize plastic sheathed three-wire cable, where the conductors are in intimate contact within the sheath. GE has no direct information or studies that define the propagation properties characteristics of the two types of wiring under controlled conditions, but it is anticipated that there would be measurable differences. Typical residences also represent fairly short (30meter) distances between adjacent homes in many neighborhoods or from residences to the 240 volt distribution transformer and system that usually feeds a series of adjacent homes. Non-consumer products, typically found in offices, schools, institutions, stores, and factories, are required to use metal

conduit, which represents a potential shielding mechanism. It is reasonable to expect that re-radiation and propagation characteristics from branch circuits in non-consumer applications will be significantly different, and that the potential for re-radiation levels would be greatly reduced compared with non-shielded wiring. Non-consumer RF lighting devices should therefore be permitted to produce a higher level of conducted emission than consumer products. Previous work by GE indicated that such an approach is justified. A study of radiated emissions of aggregate commercial electronic ballast systems found that the major source of radiated emissions came from close measurements made near or under the closest lighting fixture, where the RF lighting device was physically located, and not at intermediate locations within the installation where re-radiation from wiring should be expected to predominate if it were a significant contributor to radiated emissions. Additionally, commercial wiring runs are typically longer and present greater attenuation opportunity for conducted RF energy. The lighting fixtures in commercial installations are usually grounded and in metal housings, which provides another attenuation mechanism for the RF lighting devices themselves. Finally, in commercial applications, it is not typically expected that users would expect to receive services in the less than 30 MHz range. In fact, it is well known that reception in commercial environments presents many problems simply due to the reduced field strength within such buildings. Attenuation by structural steel, metallic trims and components, partitions, and other building materials greatly reduce the ability of radio signals in the less than 30 MHz portion of the spectrum to penetrate and propagate reliably within such structures.

11. The above environmental considerations suggest that further relaxations for conducted emissions for commercial RF lighting devices should certainly be explored, and that it is highly likely that such relaxation might be considerable with little resultant risk to radio services or communications. Similarly, these environmental considerations suggest that further relaxation for consumer products would probably not be expected to be of the same level as for commercial products, and it would not be expected that the limits should intrinsically be the same.

12. *Is there an alternative, more preferable means to control interference bands below 30 MHz?* GE is unaware of an alternative or preferable means to control interference bands below 30MHz since the predominant concern historically is not only the level of emissions measured at the device but also the potential for RF current injected into the power line to re-radiate distance from the initial RF device.

13. *Are the existing Part 15 and Part 18 conducted emission limits effective in controlling interference to services operating below 30 MHz?* With respect to RF lighting history, there have been no widespread instances of interference with services below 30 MHz. While there are many factors that contribute to this overall excellent history, one factor certainly must be that there are some limits to conducted emissions. GE submits that comments from those who use services below 30 MHz are likely to shed little light on how overly conservative the limits may in fact be, which is the fundamental question since users of the less than 30 MHz services have had no opportunity to occupy the same space with devices with no conducted emission requirements.

14. *Have there been any advances in analytical techniques that should be considered in adjusting the conducted emission limits? What interference models are available?* GE is unaware of any specific advances in models that would be directly applicable to conducted limit adjustments. To model the potential interaction between re-radiated emissions driven by conducted emissions would be a complex undertaking that would require careful validation via field measurements before it could be applied directly for the purposes of establishing or justifying limits. The model would need to take into account the propagation characteristics of the various types of wiring practices found in both consumer and non-consumer buildings. Although such a model could probably be developed, it would be based largely on many empirical measurements from a wide variety of typical wiring installations.

15. *Are adjustments to the limits appropriate to make them consistent with conducted emission limits used internationally?* As a global manufacturer and marketer, GE believes that standardized technical requirements and conformance assessment practices benefit all parties in the long run. Any such changes that would harmonize Commission rules with international requirements for conducted emission limits need to be considered carefully since the limits, test methods, and philosophies that underlay the two sets of requirements are vastly different. The primary international standard for RF lighting devices is IEC/CISPR 15. While some harmonization has occurred between test methods (for example, FCC MP5 and CISPR 15) there still remain considerable differences and philosophies that would need to be resolved before a case could be made for identical limits. In addition, the Commission's rules allow for a two-environment approach for Part 15 and Part 18 devices where it is accepted that more restrictive limits should be applied for consumer environments that may include AM and other radio services. This approach is extremely practical and beneficial to manufacturers and end users alike. CISPR 15 provides for only one conducted emission limit, which is overly burdensome for non-consumer products. GE would therefore not support adopting the current CISPR 15 one level conducted emission limit into Part 18. In addition, CISPR 15 conducted emission limits start at 9 kHz, whereas conducted limits begin at 450 kHz under the Commission's rules. Since there has never been a history of interference below 450 kHz, there is no justification for conducted emission limits in this range.

16. There is evidence to suggest that the CISPR limits between 450 kHz and 30 MHz would represent a beneficial harmonization and should be considered by the Commission as a reasonable first step in relaxation of the consumer RF lighting device conducted emission limits over this frequency range. GE is aware of no interference issues in Europe between RF lighting devices in residences and radio services in the less than 30 MHz range. Accordingly, adopting the CISPR 15 conducted emission limits between 450 kHz and 30 MHz represents a reasonable and low risk first step towards harmonization for consumer limits that at the same time protects radio services and relaxes burdensome provisions of the current rules for CFLs, EFLs, and electronic ballasts that serve the consumer market. This approach is low risk to US

consumers and users of less than 30 MHz services since the same basic radio services are used both in the US and Europe. In addition, residential density is, on average, greater in Europe than in the US. There have been no historical problems reported with millions of RF lighting devices operating in the more densely populated European residential areas. It is highly unlikely that a relaxation from current commission levels to current CISPR levels between 450 kHz and 30 MHz would result in interference issues from RF lighting devices in the less densely populated US residential areas. Such a step should be a necessary requisite before further consumer conducted emission limits relaxations should be undertaken, but one the Commission could and should consider taking in the near term. If even a slightly increased interference pattern evolves with these relaxed limits, the Commission would have a good case not to pursue additional consumer relaxations.

17. GE plans to provide field test information to the Commission at a future date that would demonstrate that such a relaxation is warranted and not objectionable to services below 30 MHz in the consumer environment such as residential homes, apartments and condominiums.

18. Independent of the moderate relaxation that is proposed for non-consumer devices under ET Docket 98-42, consideration should be given in future rulemaking to consider and evaluate a 30 dB relaxation beyond the current Part 18 conducted emission limits for RF lighting devices over the range 450 KHz to 30 MHz.

19. GE plans to provide field test information to the Commission at some future date that would demonstrate that such a relaxation is warranted and not objectionable to services below 30 MHz in non-consumer environments such as offices, stores, and schools.

20. GE proposes the following relaxations for consideration in future rulemaking in this matter. At this time GE's proposal is for RF lighting, but the Commission and others may wish to consider these limits for other classes of Part 15 and Part 18 devices.

Consumer Conducted Emission Limits

Frequency (MHz)	Maximum RF line voltage (Quasi Peak Detection) measured with a 5uH/50 ohm LISN per MP5	
	dBuV	uV
0.45 to 2.2 MHz	56	630
2.2 to 3.0 MHz	73	4470
3.0 to 30.0 MHz	60	1000

Non-Consumer Conducted Emission Limits

Frequency (MHz)	Maximum RF line voltage (Quasi Peak Detection) measured with a 5uH/50 ohm LISN per MP5	
	dBuV	uV
0.45 to 1.705 MHz	90	31,600
1.703 to 30.0 MHz	100	100,000

21. *Should the Commission consider other product requirements, such as electrical safety, in adjusting the conducted emission limits?* Other organizations develop standards for product safety. UL often writes such standards in the U.S. Internationally, IEC and ISO safety standards are often preferred. Although there may sometimes be an interaction between the coincided needs of meeting conducted emission limits and leakage current, such coincident needs are not always in conflict or mutually exclusive. No hard and fast relationship could meet all product needs and application. At the same time, the Commission should be responsive to resetting conducted emission limits where there is an interaction

with safety standard requirements and where risk to radio or communication services does not appear to be likely.

22. *What percentages of product costs are typically attributable to the Commission's regulations governing conducted emissions? What are the typical costs for filtering that may be required to achieve compliance?* It is difficult to apportion product costs to only conducted emissions compliance, as testing must be performed for both radiated and conducted compliance. On average, perhaps half the testing cost could be attributed to conducted emission testing on a routine basis. However, if an engineer is iteratively designing conducted filtering circuits because a particular RF lighting device is near the limit, this iterative process and subsequent verification testing could represent many thousands of dollars. On the other hand, laboratory and EMI measurement equipment is usually used to measure both conducted and radiated emissions, so it would be retained in any effect even if there were no conducted emission limits.

23. Typically, relatively simple L-C circuits are used to attenuate the RF voltages for RF lighting devices. Specific component costs are typically a function of current handling capability as well as reliability considerations. Capacitors that go across the line may have safety implications that may also add costs. In small RF lighting devices, size and configurational layout is also an important consideration, and such considerations can impact the indirect cost of the product well beyond the initial component costs. In common low wattage CFLs the direct and indirect costs represented by the filtering can equal 10% of the product cost. This amount can be very significant in determining whether a product sells well or whether a manufacturer makes sufficient profit margin to justify investment. Certain L-C filter components, for instance, may cost eight to ten cents for a small CFL. This cost, passed through to the retailer and end user, can easily add 25-30 cents to the final customer—in all likelihood, more on the order of 90 cents for the filter and another 39-50 cents for internal coatings that are needed in addition to the L-C filter. This $1.20 - $1.40 can translate to between $3 and $4.50 in selling price, a significant cost when the end user acquisition price point is sensitive to every additional dollar. RF lighting devices range

from approximately $15 to $25 or $30 to the end user, so even a fraction of a dollar is significant in added price, let alone $3-$4.50.

24. *If the limits were relaxed in some fashion, how much of a change would need to occur before there would be any significant product savings?* A relaxation of 10 dB is a very significant amount for consumer or non-consumer product categories. In some RF lighting products, a certain amount of iterative design must occur for a new model if the unit is "close" to meeting the conducted limits or barely meets them. Then redesigns and re-testing must occur until the manufacturer achieves a reasonable margin below the limit to account for product variation. In many cases 10 dB would provide both a nominal but still significant reduction in the basic L-C filter cost plus allow for reduced design iteration, less re-testing, and faster product introductions. All of these together represent a very significant practical benefit to a manufacturer. A relaxation of 20-25 dB becomes even more significant since not only can L-C costs be reduced further, but reductions of 20-25 dB may allow the entire input circuit configuration to change in a way that may provide other benefits, such as increased reliability, different physical configurations or smaller size.

25. *Are there types of products for which it is particularly costly to achieve compliance? What types of products and what types of cost factors?* EFLs have been specifically discussed earlier and have also been the subject of prior comments by GE. The nature of the solenoidal field generated in the bulb makes this type of product more difficult and costly to manufacture from a conducted emissions perspective, since the magnets field from the bulb can more readily induce additional RF energy within the product that manifests itself as increased conducted emissions when the product is tested. To meet current limits, sophisticated and difficult-to-apply coatings must be added to the lamp, which raises cost and makes production harder to achieve.

26. *How might the Commission change the regulations pertaining to conducted emissions to accomplish the objective of controlling interference while minimizing costs?* In Paragraph 18, GE provided recommendations for the Commission to consider for future rulemaking. These recommendations have incorporated all of the considerations discussed previously and represent proposals for relaxation that would be very significant to GE and other RF lighting manufacturers yet still be protective of the radio and communication services below 30 MHz.

27. *What new technologies, if any, are impeded by the conducted emission requirements?* As noted by the Commission, there is already a rulemaking in progress for several new RF lighting technologies that are impeded at the moment by conducted emission regulations. GE refers the Commission to its comments to ET Docket No. 98-42. In general, however, products most likely to be impeded would be those that are targeted at extremely low cost, such as RF lighting products, and that are intended to replace other existing very low cost alternatives, i.e., the conventional incandescent light bulb. Products that sell for hundreds of dollars are less likely to be presented with as significant a barrier by the conducted emission regulations.

Conclusion

28. GE urges the Commission to enact the proposed conducted emission relaxations in ET Docket No. 98-42. This rulemaking should proceed swiftly and be considered independently of the matters discussed in this Notice. The RF lighting devices covered in ET Docket No. 98-42 represent new technology that is being impeded by the current conducted emission regulations. This Notice deals with potential additional relaxations for RF lighting and other devices that the Commission should also consider. The Commission is urged to consider the recommendations presented in these comments and to also consider holding a public workshop to discuss these and other submitted comments in more detail

with interested parties before issuing a Notice of Proposed Rulemaking. The Commission should consider that there may be other interested parties, particularly research organizations that may be interested in developing models that might result in better understanding of how conducted emissions are translated into radiated emissions under different wiring practices.

Respectfully submitted,

Richard M. Jackson

General Electric Company
Lighting Legal Operation
Nela Park
Cleveland, Ohio 44112
(216) 266-2500

Edward M. Yandek

General Electric Lighting
Nela Park
Cleveland, Ohio 44112
(216) 266-2385

Donald Zeifang
Michael Ruger

Counsel to General Electric Company

Baker & Hostetler LLP
1050 Connecticut Avenue, NW
Suite 1100
Washington, D.C. 20036
(202) 861-1500